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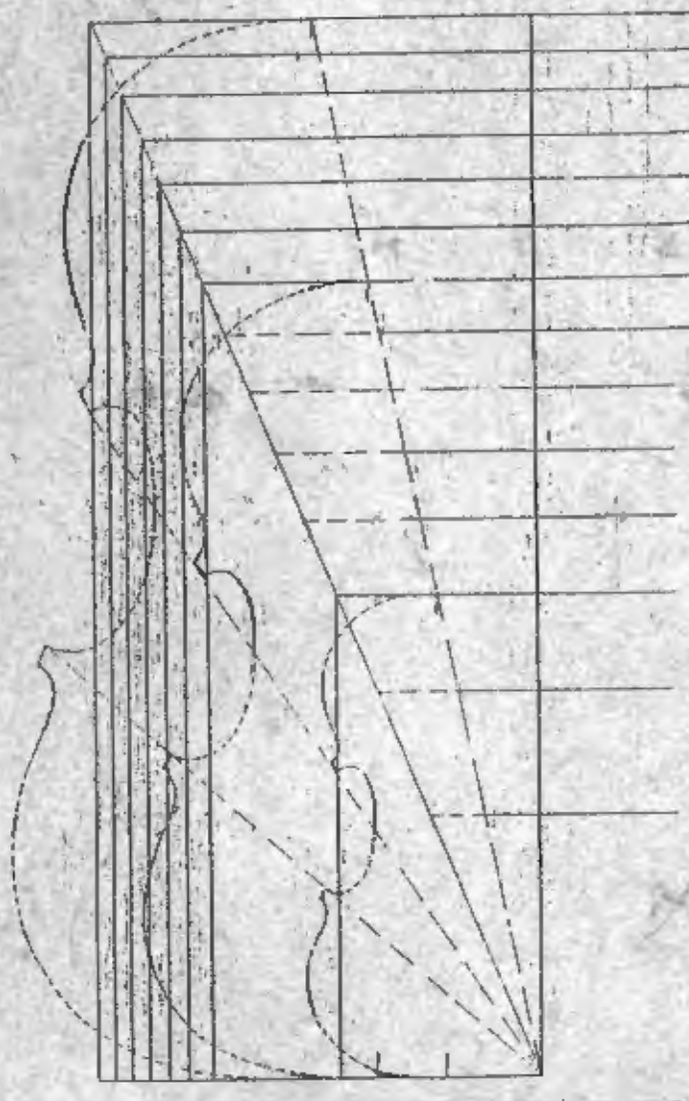
PROGECT

"ALTERNANCE AND TRANSITION"

GRUPPO STUDI LIUTARI

VIOLIN MAKING WORK BOOK N°13



THE VIOLIN AND ITS REDUCED SIZES

VIOLIN MAKING WORK BOOK N. 13

"THE VIOLIN AND ITS REDUCED SIZES"

THE REALIZATION OF THE " GRUPPO STUDI LIUTARI"

CREMONA 1980

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P R E F A C E

In this publication, represented are the results of a research in which aim is the settling down, in objective terms, the different sizes of the violin.

Because of the constant ambiguity in the current distinctions of material; the problem of rational research or the appropriate settling down of the conventional sizes with analitical method had to be confronted.

In the descriptive part that follows, the conclusions are obviously derived by mathematical means. Conclusions have been verified in the "Civic Museum" - Cremona, then the measurements of every single part of the violin, distinct from each mould, have been summerized and filed.

It comes into consideration that the measurements brought forth, even though linked to the stradivarian conception in relations, should not be understood in rigid terms; rather as a media that permits the possibility of moderate stylical variations. In summary it is considered appropriate simplifying the discourse by bringing forth the principal dimensions of some instruments by famous Makers:

MAKER/YEAR	LENGHT	POST. WIDTH	SUP. WIDTH
Nicolò Amati 1671	352,5	201,6	162
Nicolò Amati 1682	354	209.5	169.9
Antonio Stradivari 1684	349.3	200	160.3
Antonio Stradivari 1689	357.2	209.6	171.5
Antonio Stradivari 1718	358.2	209.6	169.9
Andrea Guarneri 1660	349	200	162
Andrea Guarneri 1676	356	206	166
G. Guarneri del Gesù 1726	355.6	205	166
G. Guarneri del Gesù 1730	352	205	166
G. Guarneri del Gesù 1734	352	206	165

The research is then completed with the "diagram-histogram" that graphically represents the mathematical conclusions on the different sizes of the violin, let alone the plates, relative to each size, are the outlines and the "internal forms" of the instruments. The "ff" and the lateral profiles of the scrolls are worked-out on the drawing board separately.

It is further-more considered approvable to add in, some plates of significant instruments by great Makers of the past.

THE VIOLIN AND ITS REDUCED SIZES

It is the aim of this research to organically synthetize the method used in determining the measurements of the different parts of the violin; by drawing out of origin the (by now consolidated) full or 4/4 size froms, to arriving to the reduced dimentions of the forms.

First of all it is convenient to clearly specify the finilized details, then to the fixation of the methodological criteria that presides the individualization of the sizes, criteria which is often applied in extemporaneous ways if not ignored, to where the difference of the measurements of norm are attributed to one fixed size or form.

In exeption to the viola, the traditional sizes of the violins and cellos are individualized and consistent in the following decreasing order:

4/4 ; 7/8 ; 3/4 ; 1/2 ; 1/4

In such a way, the relations would not seem correlated in mathematical sense to any of the measurements of the full size form. In which, perhaps, it is the motive to these confusions in the references.

As the matter of fact, the accurate analysis has evidenced out the

impropriate formulations of the ambigual references. It is to be understood that for instance size 1/4 refers to the body of the instrument which has a reduced lenght of 1/4 respecting the body lenght of the full (4/4) size.

Take for example the current measurement of the body 356 mm. (fr. Violin Berthier 1716 of A. Stradivari) the measurement 1/4 is obtained:

356 mm. - 1/4 x 356 = 356 - 89 = 267 mm.

corrispondent, as example to the body lenght of violin "L'Aiglon" 1734 A. Stradivari (internal form lenght including end blocks, 260 mm. - Cremona - Civic Museum).

So, on the surface difference of the two bodies, in the 4/4 and 1/4, it is therefore about operating the subdivisions according to the relations given above, to serve, as we'll see, for calculating the reduced body sizes.

REDUCING THE SIZES USING S.C.D

For calculating it is necessary to use the smallest common denominator, in which we'll have:

traditional relations:	4/4 ;	7/8 ;	3/4 ;	; 1/2 ;	; 1/4	
S:C:D relations :	8/8 ;	7/8 ;	6/8 ;	5/8 ;	4/8 ;	3/8 ; 2/8

It is obviously evident that sizes 5/8 and 3/8 are missing in the traditional reductions; those measurements come assimilated impropriately in their neighboring relations for exess or defect.

VIOLIN

CALCULATION OF BODY SURFACE 4/4 - EQUIVALENT RECTANGLE

Now, proceeding with the surface differences already given and the profile complexity of the considered instrument shown. We need to put into effect the integration of the 4/4 belly by way of the integrating instrument (planimeter) or, by means of subdivisions of the form surface is many simple geometric figures (rectangle, triangles, trapezoids) therefore operating the sums of the respective elementary area.

It is felt appropriate to avoid the reader with such an operation so reported and already calculated, the integrated belly surface of the 4/4 violin, results - mm2 52.807 (at the end of the following calculations, the measurements are not critical).

It is necessary at the end to semplify the operations, proceeding with the equivalent rectangle; or else by having the same belly surface, applying the conditions that the height of the equivalent rectangle be the same lenght as the belly considered.

The octaves in reduction are therefore 6, in which we'll have:

surface difference mm2 23.103 : 6 = 3850,5 mm2
which represents as the constant of surface in reducing octave after octave or else;

violin belly 7/8

(belly surface 8/8) mm2 52.807 - 3850,5 = 48.956,5 mm2
which is the belly surface of size 7/8.

Now utilizing its equivalent rectangle having the height the same as the lenght of the 7/8 belly, and the base in 2,4 relation using "h" as height we'll have:

$hx \frac{h}{2,4} = 48.956,5$ in which

$h^2 = 2,4 \times 48.956,5$ and therefore

$h = \sqrt{117.495,6} = 342,776$ mm

which is rounded to 343 mm.
likewise for the other reductions:

violin 6/8

(belly surface 7/8) mm2 48.956,5 - 3850,5 = 45.106 mm2

$h = \sqrt{2,4 \times 45.106} = 329,02$ rounded to 330 mm.

violin 5/8

(belly surface 6/8) mm2 45.106 - 3850,5 = 41.255,5 mm2

h= $\sqrt{2,4 \times 41.255,5}$ = 314,66 rounded to 315 mm

violin 4/8

(belly surface 5/8) mm2 41.255,5 - 3850,5 = 37.405 mm2

h = $\sqrt{2,4 \times 35.405}$ = 299,62 rounded to 300mm

violin 3/8

(belly surface 4/8) mm2 37.405 - 3850,5 = 33.554,5 mm2

h = $\sqrt{2,4 \times 33.554,5}$ = 283,78 rounded to 284 mm

violin 2/8

(belly surface 3/8) mm2 33.554,5 - 3850,5 = 29.704 mm2

h = $\sqrt{2,4 \times 29.704}$ = 267 mm

The results of the bases for the equivalent rectangles are:

- size 8/8 (4/4) mm. 356/2,4 = 148,33 mm
- size 7/8 mm. 343/2,4 = 143 mm
- size 6/8 (3/4) mm. 330/2,4 = 137,5 mm
- size 5/8 mm. 315/2,4 = 131,25 mm

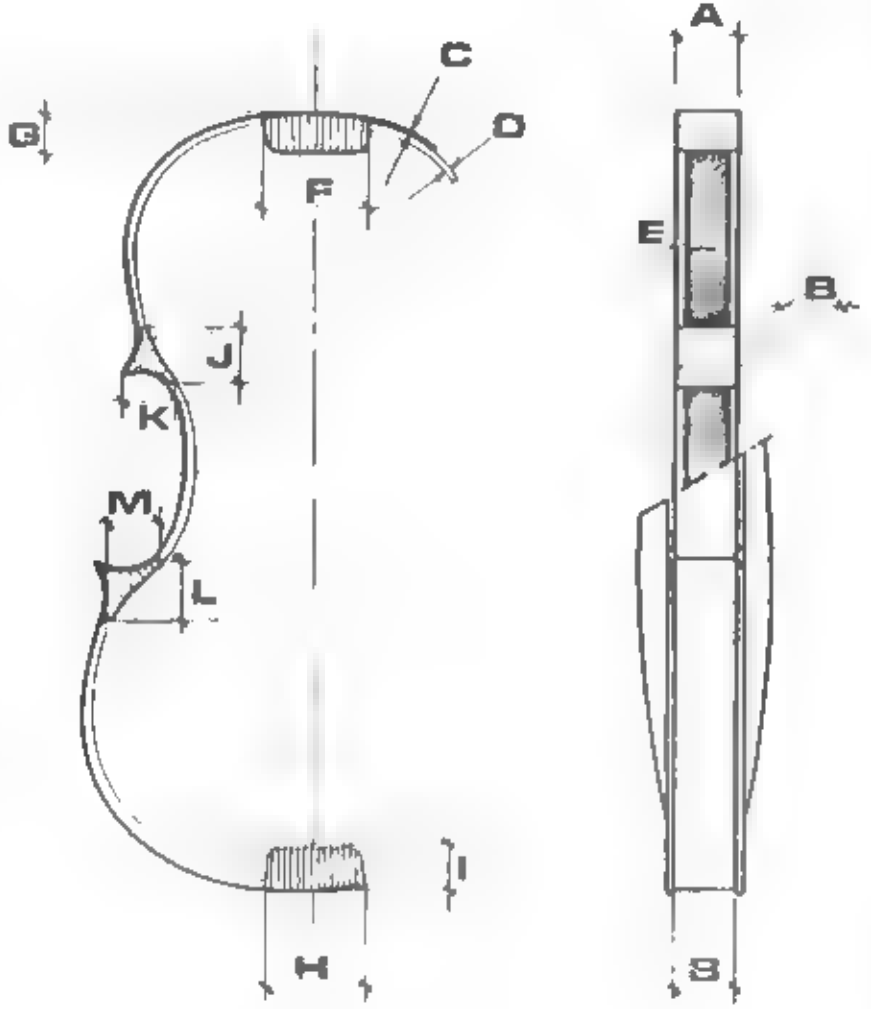
- size 4/8 (1/2) mm. 300/2,4 = 125 mm
- size 3/8 mm. 284/2,4 = 118,33 mm
- size 2/8 (1/4) mm. 267/2,4 = 111,25 mm

GRAPHIC REPRESENTATION

In design plate "A", represented is the diagram-histogram which summerizes the description now operated. As a matter of fact, the equivalent rectangles to the sequence of the sizes are represented in decreasing order.

For the equivalent rectangles to sizes 4/4 and 1/4, the semiprofiles of the respective plates of the intruments have been traced.

The semiprofile of a small violin, size 1/24, has also been traced, the form of that intrument is attributed to Antonio Stradivari and existent in the "Cremona Civic Museum", having a lenght (including blocks) of 157 mm.

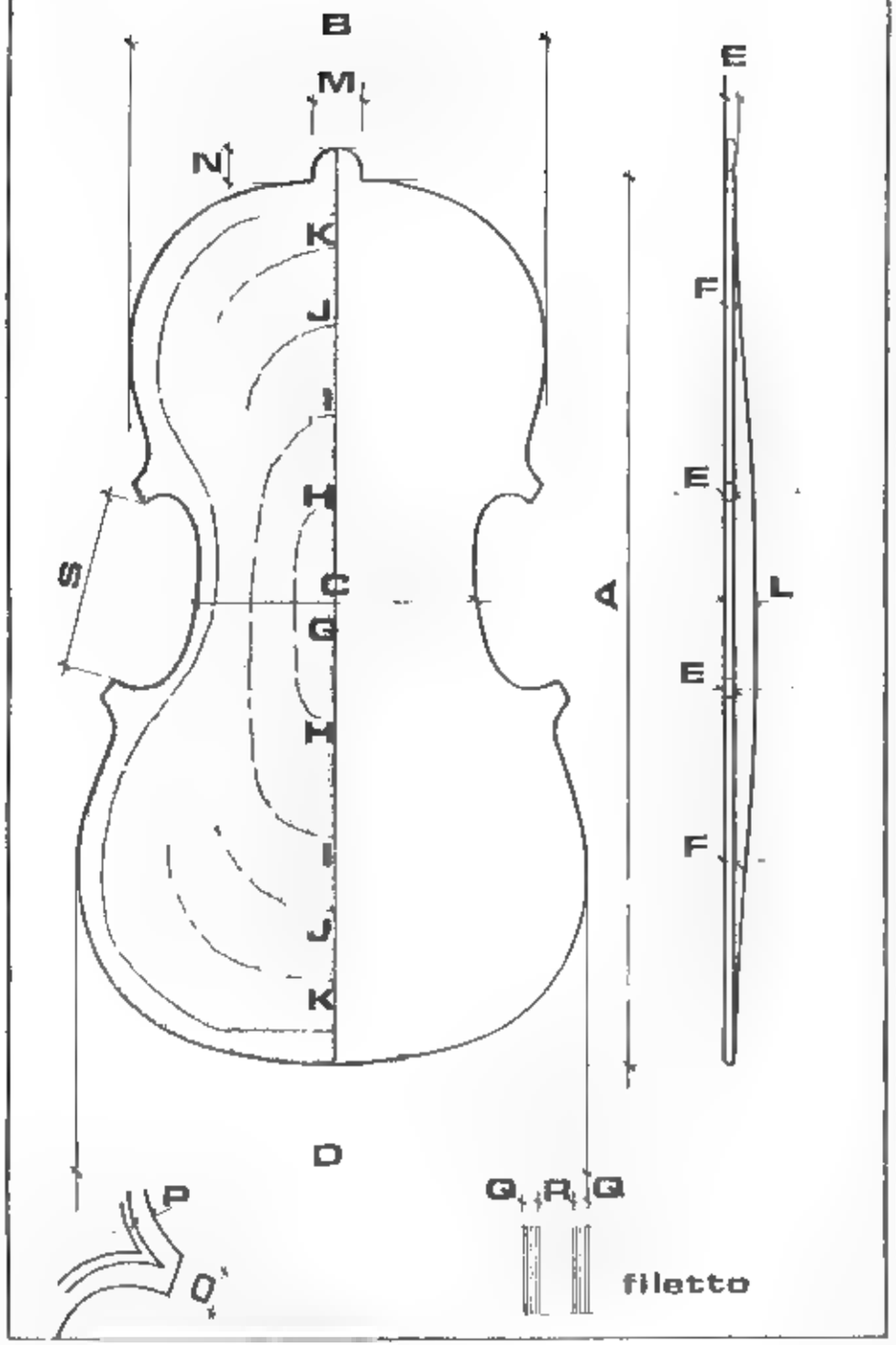


STRUMENTO violin

Particolare ribs

MISURE IN MILLIMETRI

Lit.	formato 1/4	3/8	1/2	5/8	3/4	7/8	4/4	note
A	22 5	24	25.3	26 6	28	29	30	
B	24	25	26 2	27.5	29	30	31	
C	1	1	1.1	1 1	1 2	1.2	1.3	
D	1.5	1.5	1.6	1 7	1.8	1.9	2	
E	6	6.5	6 8	7	7.5	7.8	8	
F	41	43	46	48	50	52	54	
G	11	11.5	12	12 5	13	13 5	14	
H	38	40	42	44	46	48	50	
I	11	11 5	12	12 5	13	13 5	14	
J	20	21	22	23	24	25	26	
K	9	9.5	10	10 5	11	11.5	12	
L	19	20	21	22	23	24	25	
M	10	10.5	11	11,5	12	12.5	13	
N								
O								
P								
Q								
R								
S								
T								
U								
V								
W								
X								
Y								
Z								

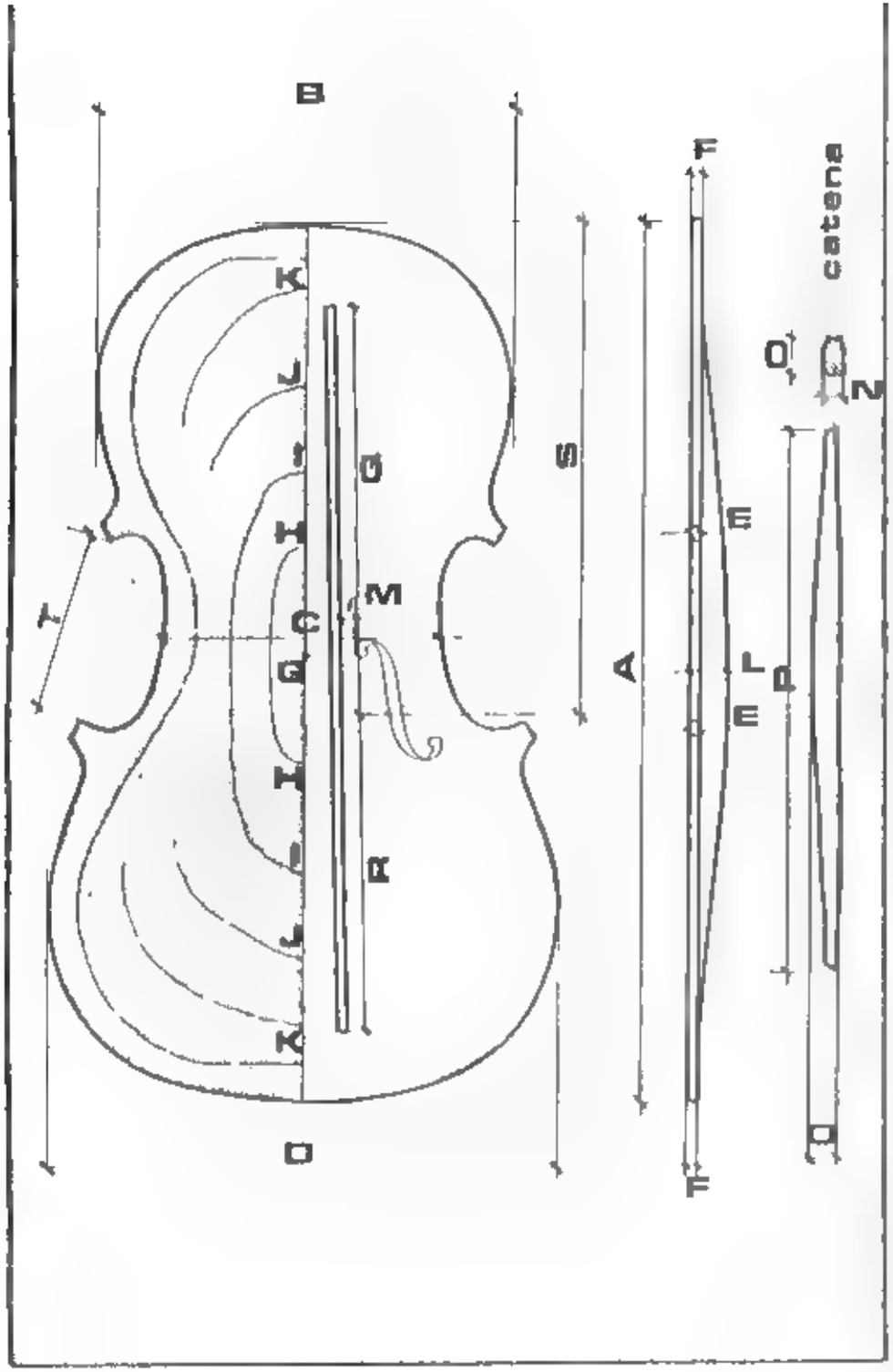


Particolare **back**

MISURE IN MILLIMETRI

2

dif.	formato								note
	1/4	3/8	1/2	5/8	3/4	7/8	4/4		
A	267	284	300	315	330	343	356		
B	126	134	142	148	156	162	168		
C	84	89	94	99	104	108	112		
D	156	166	175	184	193	201	208		
E	3,4	3,6	3,8	3,8	4,0	4,0	4,3		
F	3,2	3,4	3,6	3,6	3,8	3,8	4,0		
G	3,4	3,6	3,8	4,0	4,2	4,3	4,5		
H	2,9	3,1	3,3	3,5	3,7	3,8	4,0		
I	2,4	2,6	2,8	3,0	3,2	3,3	3,5		
J	1 9	2,1	2,3	2,5	2,7	2,8	3,0		
K	1,4	1,6	1,8	2 0	2,2	2,3	2,5		
L	11,3	12,0	12,6	13,3	13,9	14,5	15,0		
M	16,5	17,5	18,5	19,0	20,0	21,0	22,0		
N	9,0	9,5	10,0	10,5	11,0	11,5	12,0		
O	5 3	5,6	5,9	6,2	6,5	6,7	7,0		
P	2,9	3,1	3,3	3,5	3,7	3,8	4,0		
Q	0 2	0,2	0,2	0,2	0,2	0 3	0,3		
R	0,5	0,5	0,5	0,5	0,5	0,6	0 6		
S	58,5	62,3	65,8	69,0	72,3	75,2	78,0		
T									
U									
V									
W									
X									
Y									
Z									

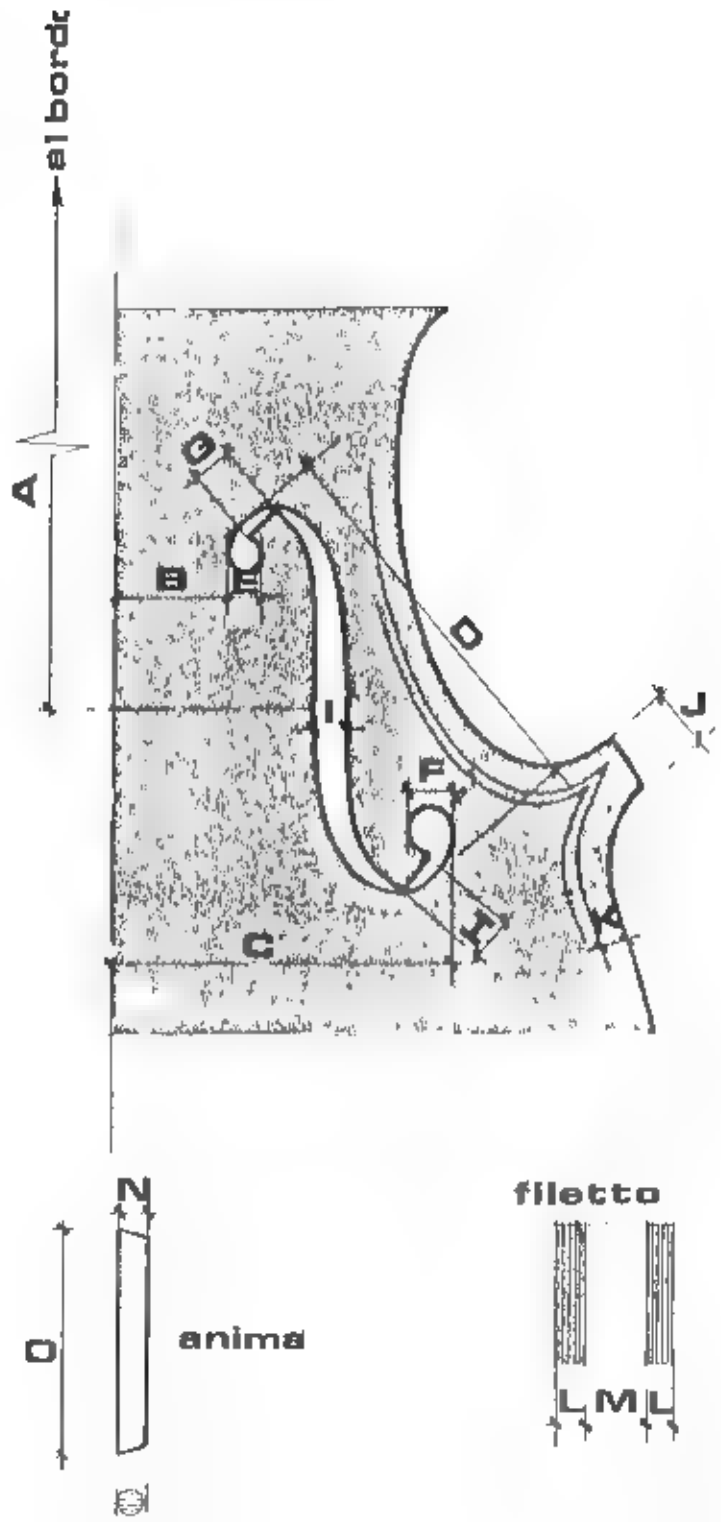


Particolare violin belly

MISURE IN MILLIMETRI

3

rif.	formato 1/4	3/8	1/2	5/8	3/4	7/8	4/4	note
A	267	284	300	315	330	343	356	
B	126	134	142	148	156	162	168	
C	84	89	94	99	104	108	112	
D	156	166	175	184	193	201	208	
E	3,4	3,6	3,8	3,8	4,0	4,0	4,3	
F	3,2	3,4	3,6	3,6	3,8	3,8	4,0	
G	2,4	2,5	2,6	2,7	2,8	2,9	3,0	
H	2,3	2,4	2,5	2,6	2,7	2,8	2,9	
I	2,2	2,3	2,4	2,5	2,6	2,7	2,8	
J	2,1	2,2	2,3	2,4	2,5	2,6	2,7	
K	2,0	2,1	2,2	2,3	2,4	2,5	2,6	
L	11,6	12,3	13,1	13,8	14,4	15,0	15,5	
M	0,5	0,5	0,5	0,5	1,0	1,0	1,0	
N	4,5	5,0	5,0	5,5	5,5	6,0	6,0	
O	10,0	10,5	11,0	11,5	12,0	12,5	13,0	
P	210	220	230	240	250	260	270	
Q	116	122	128	133	139	144	150	
R	94	98	102	107	111	116	120	
S	146	156	165	173	181	188	195	
T	58,5	62,3	65,8	69	72,3	75,2	78	
U								
V								
W								
X								
Y								
Z								



STRUMENTO Violin "ff"

Particolare

MISURE IN MILLIMETRI

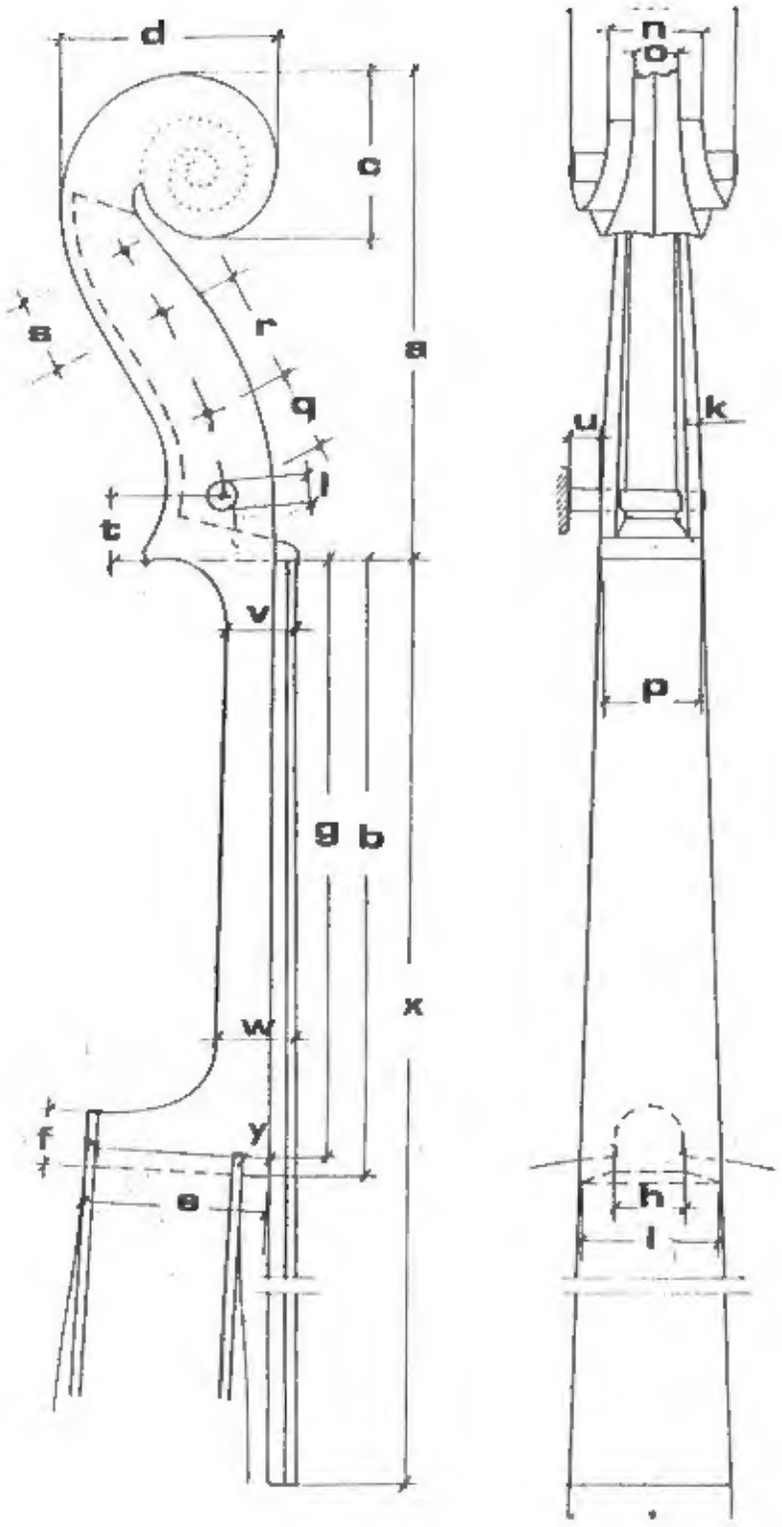
4

Rif.	formato 1/4	3/8	1/2	5/8	3/4	7/8	4/4		note.
A	146	156	165	173	181	188	195		
B	15,8	16,8	17,7	18,6	19,5	20,3	21,0		
C	45	48	51	53	56	58	66		
D	57	60,6	64	67,3	70,5	73,3	76		
E	4,9	5,2	5,5	5,8	6	6,3	6,5		
F	6,8	7,2	7,6	8	8,4	8,7	9		
G	5,3	5,6	5,9	6,2	6,5	6,8	7		
H	6	6,4	6,7	7	7,4	7,7	8		
I	4,5	4,8	5	5,3	5,6	5,8	6		
J	5,3	5,6	5,9	6,2	6,5	6,7	7		
K	2,9	3,1	3,3	3,5	3,7	3,8	4		
L	0,2	0,2	0,2	0,2	0,2	0,3	0,3		
M	0,5	0,5	0,5	0,5	0,5	0,6	0,6		
N	4,5	4,8	5	5,3	5,6	5,8	6		
O	40	42	45	47	49	51	53		
P									
Q									
R									
S									
T									
U									
V									
W									
X									
Y									
Z									

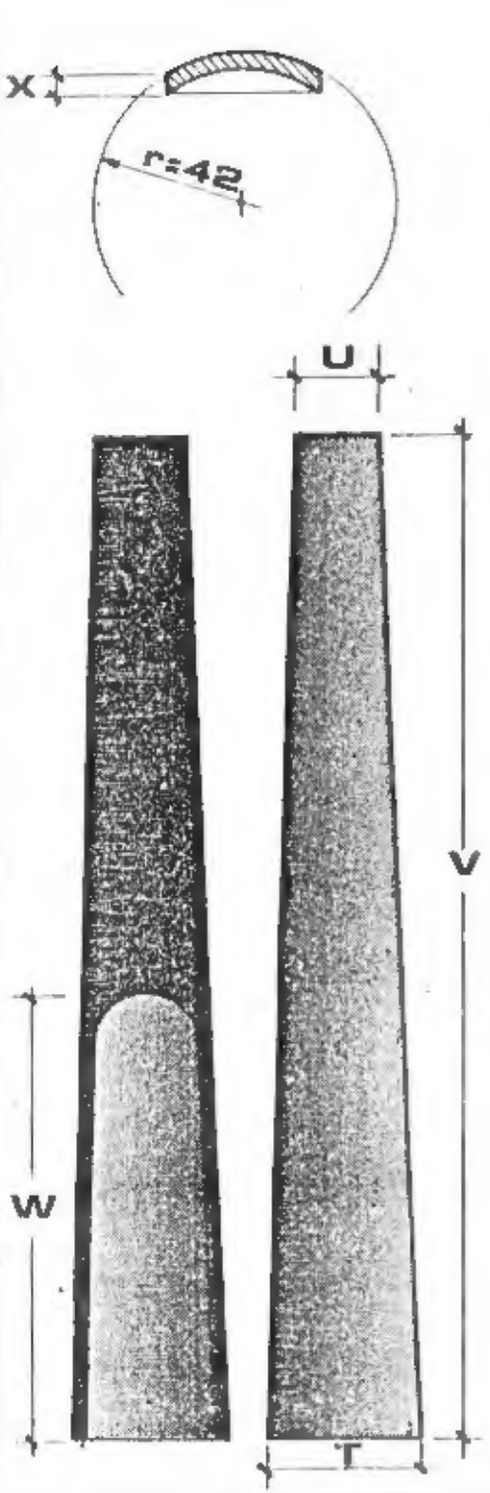
STRUMENTO violin

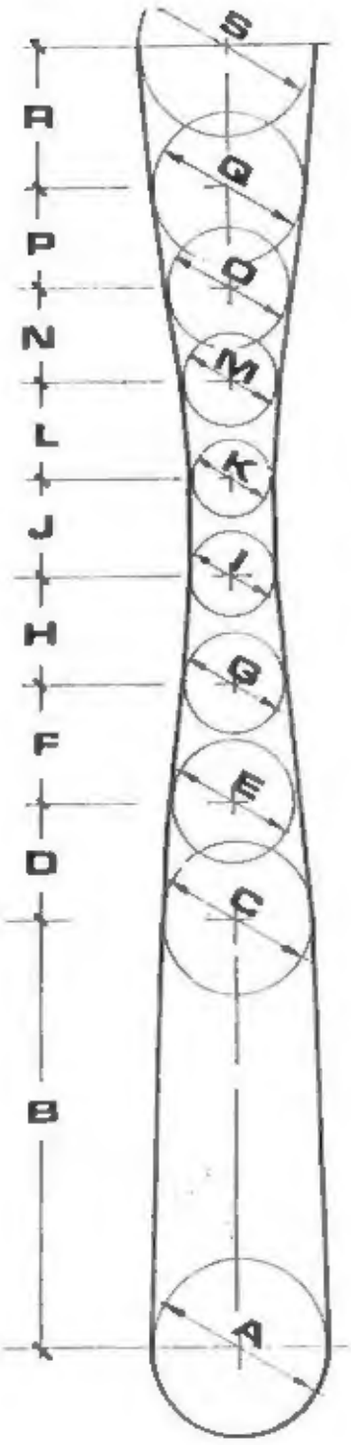
Particolare **hech and scroll**

MISURE IN MILLIMETRI



Liv.	formato 1/4	3/8	1/2	5/8	3/4	7/8	4/4	note
A	80	85	89	94	98	102	106	
B	101	110	115	120	126	131	136	
C	30	32	34	35,5	37	38,5	40	
D	38,3	40,7	43,0	45,1	47,3	49,2	51	
E	34	36	38	40	42	43,5	45	
F	16,5	17,5	18,5	19	20	21	22	
G	97	104	110	115	121	125	130	
H	17,5	18,5	19,5	20,5	21,5	22	23	
I	25	26	27,5	29	30,5	32	33	
J	31,5	33,5	35,5	37,5	39	40,5	42	
K	3,8	4	4,2	4,4	4,6	4,8	5	
L	5,0	5,4	5,7	6,1	6,4	6,7	7	
M	31,5	33,5	35,5	37,5	39	40,5	42	
N	19	20	21	22	23	24	25	
O	9,5	10	10,5	11	11,5	12	12,5	
P	19	20	21	22	23	23,5	24,5	
Q	11,3	12	12,7	13,3	14	14,5	15	
R	15,8	16,8	17,7	18,6	19,5	20,3	21	
S	11,3	12	12,7	13,3	14	14,5	15	
T	12	12,8	13,5	14,1	14,8	15,5	16	
U	7,5	8	8,4	8,8	9,3	9,6	10	
V	13,9	14,8	15,6	16,4	17,1	17,8	18,5	
W	17	18	19	20	20,9	21,7	22	
X	202	215	227	240	250	260	270	
Y	4,5	4,8	5	5,3	5,6	5,8	6	
Z								



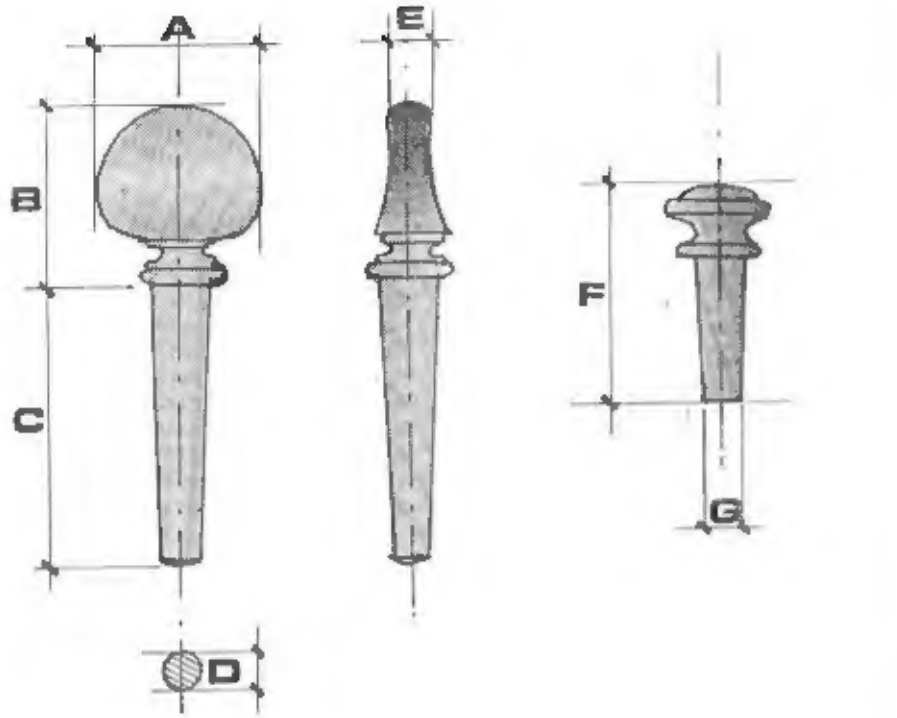


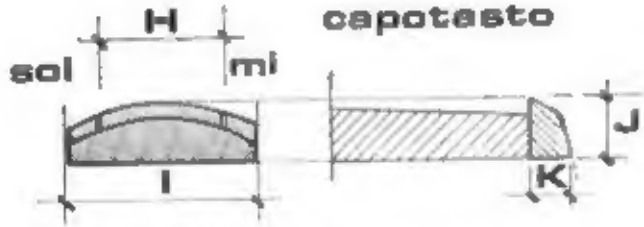
STRUMENTO violin

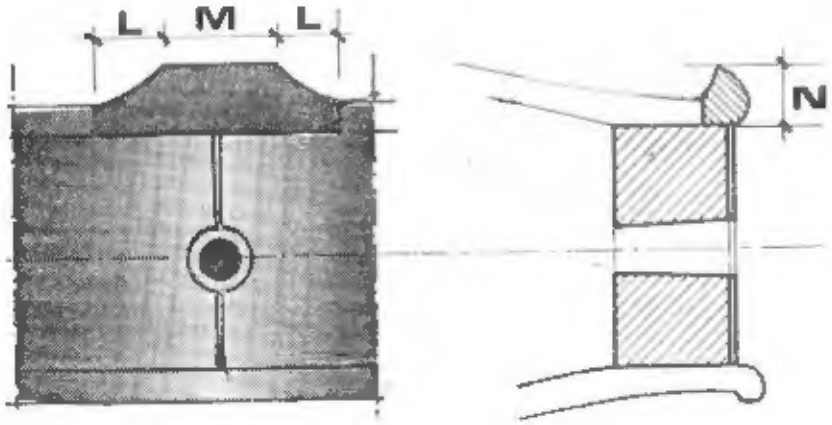
Particolare *tastiera e dorso testa*

MISURE IN MILLIMETRI

Lit.	formato 1/4	3/8	1/2	5/8	3/4	7/8	4/4		note
A	19,5	20,8	22	23	24,1	25	26		
B	48,8	51,9	54,8	57,5	60,2	62,6	65		
C	16,5	17,6	18,5	19,5	20,4	21,2	22		
D	13,5	14,4	15,2	15,9	16,7	17,4	18		
E	13,5	14,4	15,2	15,9	16,7	17,4	18		
F	13,5	14,4	15,2	15,9	16,7	17,4	18		
G	10,9	11,6	12,2	12,8	13,4	13,9	14,5		
H	12	12,8	13,5	14,1	14,8	15,4	16		
I	9,4	10	10,5	11	11,6	12	12,5		
J	11,3	12	12,6	13,3	13,9	14,5	15		
K	9,8	10,4	11	11,5	12	12,5	13		
L	11,3	12	12,6	13,3	13,9	14,5	15		
M	11,3	12	12,6	13,3	13,9	14,5	15		
N	11,3	12	12,6	13,3	13,9	14,5	15		
O	14,3	15,2	16	16,8	17,6	18,3	19		
P	11,3	12	12,6	13,3	13,9	14,5	15		
Q	17,3	18,4	19,4	20,3	21,3	22,2	23		
R	15,8	16,8	17,7	18,6	19,5	20,2	21		
S	19,5	20,8	22	23	24,1	25	26		
T	31,5	33,5	35,4	37,2	39	40,5	42		
U	21,5	22	22,5	23	23,5	24	24,5		
V	202	215	227	240	250	260	270		
W	94	100	105	110	116	120	125		
X	3,8	4	4,2	4,4	4,6	4,8	5		
Y									
Z									





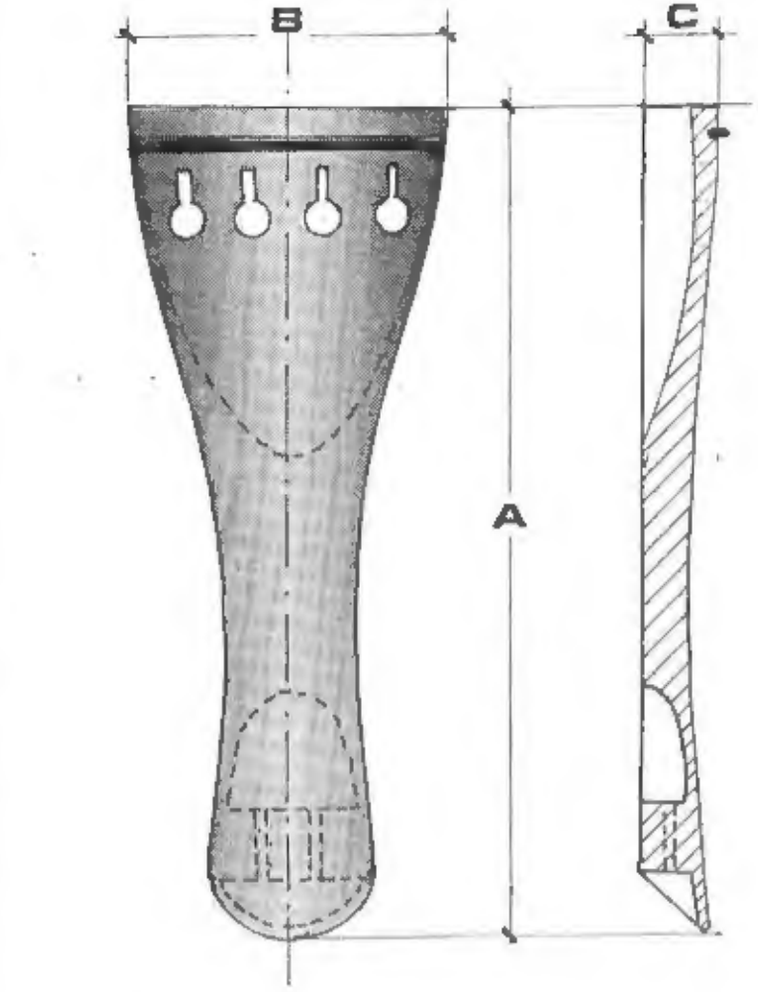


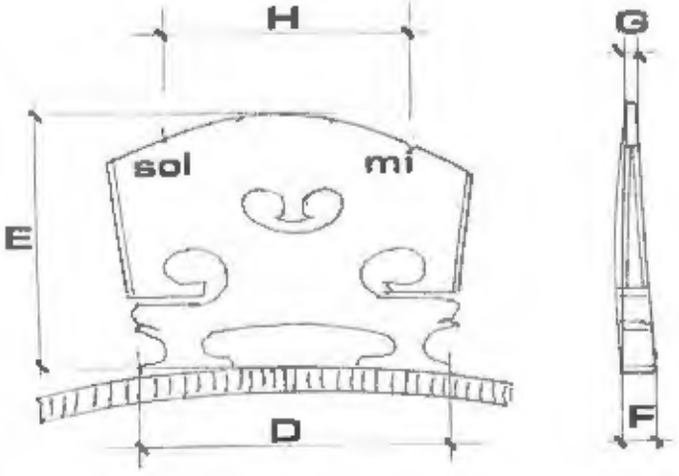
STRUMENTO violino

Particolare montatura

MISURE IN MILLIMETRI

	formato								note
	1/4	3/8	1/2	5/8	3/4	7/8	4/4		
A	16.5	17.6	18.5	19.5	20.4	21.2	22		
B	18	19.2	20.3	21.3	22.3	23.2	24		
C	27.8	29.6	31.2	32.8	34.3	35.7	37		
D	4.5	4.8	5	5.3	5.6	5.8	6		
E	6	6.4	6.7	7.1	7.4	7.7	8		
F	24	25.5	27	28.3	29.7	30.8	32		
G	5.6	6	6.3	6.6	6.9	7.2	7.5		
H	12.8	13.6	14.3	15	15.8	16.4	17		
I	18.4	19.6	20.7	21.7	22.7	23.6	24.5		
J	6.4	6.8	7.2	7.5	7.9	8.2	8.5		
K	4.5	4.8	5	5.3	5.6	5.8	6		
L	6	6.4	6.7	7.1	7.4	7.7	8		
M	12.8	13.6	14.3	15	15.8	16.4	17		
N	6	6.4	6.7	7.1	7.4	7.7	8		
O									
P									
Q									
R									
S									
T									
U									
V									
W									
X									
Y									
Z									





STRUMENTO violino

Particolare cordiera-ponticello

MISURE IN MILLIMETRI

F.TE	formato								note
	1/4	3/8	1/2	5/8	3/4	7/8	4/4		
A	8.6	9	9.6	10	10.6	11	11.4		
B	2.9	3.1	3.3	3.5	3.7	3.8	4		
C	6.8	7.2	7.6	8	8.4	8.7	9		
D	30.8	32.7	34.6	36.3	38	39.5	41		
E	24.5	26	27.4	28.8	30.1	31.3	32.5		
F	3.4	3.5	3.6	3.7	3.8	3.9	4		
G	1	1	1	1.1	1.1	1.2	1.2		
H	25	26	27.5	29	30.5	32	33		
I									
J									
K									
L									
M									
N									
O									
P									
Q									
R									
S									
T									
U									
V									
W									
X									
Y									
Z									